



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Alfred Homes Ltd

Project: 2 Kilmeston Close
Winchester, SO22 6TL

Contact: Scott Spearing | BEAT Solutions
[REDACTED]

Report Issue Date: 03/11/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	SAP-1260 - Plot 2	Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref	
Property	2 Kilmeston Close, Winchester, SO22 6TL		

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. Sco Spearing, Sco Spearing, Tel: 01489 565920, sco@beatsolutions.co.uk	Assessor ID	p775-0001
------------------	--	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.92	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.68	kgCO ₂ /m ²	Pass
	-3.24 (-20.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.25	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	57.12	kWh/m ² /yr	
	-6.2 (-9.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.12 (max. 0.20)	0.16 (max. 0.35)	Pass
Openings	1.24 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.80 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Worcester Greenstar 4000 GR4700iW 21 S NG Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
---------------------	---	------

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Secondary heating system	None	
5 Cylinder insulation		
Hot water storage	Measured cylinder loss: 1.63 kWh/day Permitted by DBSCG 2.53	Pass
Primary pipework insulated	Yes	Pass
6 Controls		
Space heating controls	Time and temperature zone control	Pass
Hot water controls	Cylinderstat	Pass
	Independent timer for DHW	Pass
Boiler interlock	Yes	Pass
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100 %	
Minimum	75 %	Pass
8 Mechanical ventilation		
Not applicable		

Criterion 3 – Limiting the effects of heat gains in summer

9 Summer room temperature

Overheating risk (Southern England)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing North East	14.16 m ² , No overhang	
Windows facing South East	1.96 m ² , No overhang	
Windows facing South West	14.61 m ² , No overhang	
Windows facing North West	3.04 m ² , No overhang	
Air change rate	8.00 ach	
Blinds/curtains	None	

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.80 (measured in this dwelling)	
Maximum	10.0	Pass

10 Key features

Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Photovoltaic array	3.04	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP-1260 - Plot 2	Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref	
Property	2 Kilmeston Close, Winchester, SO22 6TL		

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk	Assessor ID	p775-0001
------------------	---	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	South West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	3
3.0 Date Built	2023
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	37.67 m	79.65 m ²	2.83 m
1st Storey:	35.64 m	76.55 m ²	3.12 m
2nd Storey:	32.59 m	51.54 m ²	2.56 m

7.0 Living Area	19.84	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	253.11	kJ/m ² K

9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Net Area (m ²)
External Walls	Cavity Wall		Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	250.78	214.68
Ashlar & Dormer Walls	Timber Frame		Timber framed wall (one layer of plasterboard)	0.21	9.00	41.35	38.51

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall - Masonry	Dense block, plasterboard on dabs		75.00	90.72
Internal Wall - Timber	Plasterboard on timber frame		9.00	196.05

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Net Area (m ²)
Flat Bay Roofs	External Flat Roof		Plasterboard, insulated flat roof	0.14	9.00	3.10	3.10
Pitched Cold Roof Areas	External Plane Roof		Plasterboard, insulated at ceiling level	0.10	9.00	56.65	56.65
Sloping Roofs	External Slope Roof		Plasterboard, insulated slope	0.15	9.00	21.12	18.06
Flat Dormer Roofs	External Flat Roof		Plasterboard, insulated flat roof	0.16	9.00	4.26	4.26

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling	Other	75.00	76.55
Internal Ceiling	Plasterboard ceiling, carpeted chipboard floor	9.00	51.54

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.12	75.00	79.65

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor	Other	75.00	76.55
Internal Floor	Plasterboard ceiling, carpeted chipboard floor	18.00	51.54

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Front Door	Manufacturer	Solid Door							1.40
Windows	Manufacturer	Window	Double Low-E SoD 0.05			0.63		0.70	1.20
Velux Windows	Manufacturer	Roof Window	Double Low-E SoD 0.05			0.63		0.70	1.40
Side Door	Manufacturer	Half Glazed Door	Double Low-E SoD 0.05			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Door	Solid Door	[1] External Walls	South West							2.72	
Front Elevation	Window	[1] External Walls	South West	None	0.00					11.77	
Front Dormers	Window	[2] Ashlar & Dormer Walls	South West	None	0.00					2.84	
Side Elevation	Window	[1] External Walls	North West	None	0.00					3.04	
Rear Elevation	Window	[1] External Walls	North East	None	0.00					14.16	
Rear Rooftops	Roof Window	[3] Sloping Roofs	North East	None						3.06	
Side Elevation	Window	[1] External Walls	South East	None	0.00					1.96	
Side Door	Half Glazed Door	[1] External Walls	South East							2.45	

14.0 Conservatory

15.0 Draught Proofing

%

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	22.08	0.300	Yes
Table K1 - Approved	E3 Sill	19.92	0.040	Yes
Table K1 - Approved	E4 Jamb	61.50	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	37.67	0.160	Yes
Table K1 - Approved	E6 Intermediate floor within a dwelling	68.23	0.070	Yes
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	14.46	0.060	No
Table K1 - Approved	E12 Gable (insulation at ceiling level)	16.72	0.240	No
Table K1 - Approved	E13 Gable (insulation at raft level)	5.31	0.040	No
Table K1 - Default	E14 Flat roof	13.41	0.080	No
Table K1 - Approved	E16 Corner (normal)	46.48	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	8.76	-0.090	No
Table K1 - Default	R1 Head of roof window	3.12	0.080	Yes
Table K1 - Default	R2 Sill of roof window	3.12	0.060	Yes
Table K1 - Default	R3 Jamb of roof window	7.84	0.080	Yes
Table K1 - Default	R6 Flat ceiling	14.46	0.060	No
Table K1 - Default	R7 Flat ceiling (inverted)	2.05	0.040	No
Table K1 - Default	R8 Roof to wall (rafter)	16.42	0.060	No
Table K1 - Default	R9 Roof to wall (flat ceiling)	11.57	0.040	No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Cross ventilation possible

Night Ventilation

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open fires	0		0	0
Number of intermittent fans				6
Number of passive vents				0
Number of fuelless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

External

External lights fitted

23.0 Electricity Tariff

24.0 Main Heating

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Gas Boiler			
Percentage of Heat	100			%
Database Ref. No.	18910			
Fuel Type	Mains gas			
Main Heating	BGB			
SAP Code	102			
In Winter	90.6			
In Summer	79.9			
Controls	CBI Time and temperature zone control			
PCDF Controls	0			
Delayed Start Stat	Yes			
Sap Code	2110			
Flue Type	Balanced			
Fan Assisted Flue	Yes			
Is MHS Pumped	Pump in heated space			
Heat Emitter	Radiators and Underfloor			
Underfloor Heating	Yes - Pipes in thin screed			
Flow Temperature	36° - 45°C			
<hr/>				
25.0 Main Heating 2	None			
<hr/>				
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
<hr/>				
29.0 Hot Water Cylinder	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Measured Loss			
Cylinder Volume	246.00			L
Loss	1.63			kWh/day
Pipes insulation	Fully insulated primary pipework			
<hr/>				
31.0 Thermal Store	None			
<hr/>				
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
3.04	North East	45°	None Or Little	Yes
<hr/>				

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 2		Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref		
Project	2 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk	Assessor ID	p775-0001
Client	Alfred Homes Ltd, ALFRED HOMES LTD		

Building Elements

Roof Flat Bay Roofs

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex XR4000 Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	165	0.0220	7.5000	100.00
Layer 2	Joist Void Main construction Corrections - Cavity Unvented, Emissivity: Normal	125	0.7813	0.1600	100.00
Layer 3	Plasterboard, standard Main construction	15	0.2100	0.0714	100.00
Int surface				0.1000	

Total resistance: Upper limit = 7.871 m² K/W Lower limit = 7.871 m² K/W Average = 7.871 m² K/W
Total correction = 0.0091 m² K/W U-value (unrounded) = 0.14 W/m² K

Unheated space: None

Total thickness: 305 mm

U-value: 0.14 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 2		Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref		
Project	2 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk	Assessor ID	p775-0001
------------------	--	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

Building Elements

Roof Pitched Cold Roof

Roof Type: Pitched Roof, insulated Nat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Mineral wool Main construction Corrections - Air Gap: Level 0, Fasteners: None or plastic	200	0.0400	5.0000	100.00
Layer 2	Mineral wool Main construction Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	200 200	0.0400 0.1300	5.0000 1.5385	91.67 8.33
Layer 3	Plasterboard, standard Main construction	12.5	0.2100	0.0595	100.00
Layer 4	Plaster, standard Main construction	3	0.4000	0.0075	100.00
Int surface				0.1000	

Total resistance: Upper limit = 9.788 m² K/W Lower limit = 9.418 m² K/W Average = 9.603 m² K/W
 Total correction = 0.0019 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space:	None
Total thickness:	416 mm
U-value:	0.10 W/m ² K
Kappa:	n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 2		Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref		
Project	2 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk	Assessor ID	p775-0001
------------------	--	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

Building Elements

Roof Sloping Roofs

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex GA4000				
	Main construction	100	0.0220	4.5455	91.67
	Main construction	100	0.1300	0.7692	8.33
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Celotex GA4000				
	Main construction	60	0.0220	2.7273	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 6.886 m² K/W Lower limit = 6.153 m² K/W Average = 6.519 m² K/W
 Total correction = 0.0042 m² K/W U-value (unrounded) = 0.15 W/m² K

Unheated space:	None
Total thickness:	173 mm
U-value:	0.15 W/m ² K
Kappa:	n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 2		Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref		
Project	2 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk	Assessor ID	p775-0001
------------------	--	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

Building Elements

Roof Flat Dormer Roofs

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex XR4000				
	Main construction	200	0.0220	9.0909	91.67
	Main construction	200	0.1300	1.5385	8.33
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 6.821 m² K/W Lower limit = 6.651 m² K/W Average = 6.736 m² K/W
 Total correction = 0.0092 m² K/W U-value (unrounded) = 0.16 W/m² K

Unheated space: None

Total thickness: 213 mm U-value: 0.16 W/m² K Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 2		Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref		
Project	2 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ @beatsolutions.co.uk	Assessor ID	p775-0001
------------------	--	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

Building Elements

Wall External Walls

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	102.5	0.7700	0.1331	82.81
	Main construction	102.5	0.9407	0.1090	17.19
Layer 2	Plenum EcoBead				
	Main construction	150	0.0330	4.5455	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or placed				
Layer 3	Masterlite Pro				
	Main construction	100	0.5700	0.1754	93.43
	Main construction	100	0.8803	0.1136	6.57
Layer 4	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unvented, Emissivity: Normal				
Layer 5	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.245 m² K/W Lower limit = 5.243 m² K/W Average = 5.244 m² K/W
 Total correction = 0.0000 m² K/W U-value (unrounded) = 0.19 W/m² K

Unheated space: None
Total thickness: 380 mm U-value: 0.19 W/m ² K Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 2	Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref	
Project	2 Kilmeston Close, Winchester, SO22 6TL		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk	Assessor ID	p775-0001
------------------	--	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

Building Elements

Wall Ashlar & Dormer Walls

Wall Type: Timber framed Wall with I-beams

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Celotex GA4000				
	Main construction	100	0.0220	4.5455	91.67
	Main construction	100	0.1300	0.7692	8.33
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Celotex TB4000				
	Main construction	25	0.0220	1.1364	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 3	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.152 m² K/W Lower limit = 4.592 m² K/W Average = 4.872 m² K/W
 Total correction = 0.0044 m² K/W U-value (unrounded) = 0.21 W/m² K

Unheated space: None

Total thickness: 138 mm

U-value: 0.21 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP-1260 - Plot 2		Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref		
Project	2 Kilmeston Close, Winchester, SO22 6TL			
Calculation Type	New Build (As Built)			

SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		

Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ @beatsolutions.co.uk	Assessor ID	p775-0001
------------------	---	-------------	-----------

Client	Alfred Homes Ltd, ALFRED HOMES LTD
--------	------------------------------------

Building Elements

Floor Ground Floor

Floor Type: Suspended Floor

Area = 79.65 m², Perimeter = 37.67 m, Wall thickness = 320.00 mm, Soil: Unknown

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.200 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.1700	
Layer 1	Blockwork, dense				
	Main construction	100	1.5900	0.0629	82.95
	Main construction	100	2.3000	0.0435	17.05
Layer 2	Celotex XR4000				
	Main construction	150	0.0220	6.8182	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Screed				
	Main construction	75	1.1500	0.0652	100.00
Int surface				0.1700	

Total resistance: Upper limit = 7.283 m² K/W Lower limit = 7.282 m² K/W Average = 7.282 m² K/W

Total correction = 0.0088 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 325 mm

U-value: 0.12 W/m² K

Kappa: n/a

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP-1260 - Plot 2			Issued on Date	03/11/2023
Assessment Reference	AB	Prop Type Ref			
Property	2 Kilmeston Close, Winchester, SO22 6TL				
SAP Rating	89 B	DER	12.68	TER	15.92
Environmental	88 B	% DER<TER	20.37		
CO ₂ Emissions (t/year)	1.88	DFEE	57.12	TFEE	63.25
General Requirements Compliance	Pass	% DFEE<TFEE	9.69		
Assessor Details	Mr. ScoΣ Spearing, ScoΣ Spearing, Tel: 01489 565920, scoΣ@beatsolutions.co.uk			Assessor ID	p775-0001
Client	Alfred Homes Ltd, ALFRED HOMES LTD				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS BUILT

Detached House, total floor area 208 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.92 kgCO/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.68 kgCO/m²OK

1b TPFE and DFEE

Target Fabric Energy Efficiency (TPFE)63.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)57.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.24 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.80 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 21 S NG

Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.63 kWh/day
Permitted by DBSCG 2.53 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

Boiler interlock

Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Not significant OK

Based on:

Overshading: Average
Windows facing North East: 14.16 m², No overhang
Windows facing South East: 1.96 m², No overhang
Windows facing South West: 14.61 m², No overhang
Windows facing North West: 3.04 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Photovoltaic array 3.04 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6500 (1b)	x 2.8300 (2b)	= 225.4095 (1b) - (3b)
First floor	76.5500 (1c)	x 3.1200 (2c)	= 238.8360 (1c) - (3c)
Second floor	51.5400 (1d)	x 2.5600 (2d)	= 131.9424 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	207.7400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 596.1879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					6 * 10 = 60.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					60.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					4.8000
Infiltration rate					0.3406 (18)
Number of sides sheltered					0 (19)
					Shelter factor
Infiltration rate adjusted to include shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20) (21) = (18) x (20) = 0.3406 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4343	0.4258	0.4173	0.3747	0.3662	0.3236	0.3236	0.3151	0.3406	0.3662	0.3832	0.4003 (22b)
	0.5943	0.5907	0.5871	0.5702	0.5670	0.5524	0.5524	0.5496	0.5580	0.5670	0.5734	0.5801 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			33.7700	1.1450	38.6679		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			3.0600	1.3258	4.0568		(27a)
Ground Floor			79.6500	0.1200	9.5580	75.0000	5973.7500 (28a)
External Walls	250.7800	36.1000	214.6800	0.1900	40.7892	110.0000	23614.8000 (29a)
Ashlar & Dormer Walls	41.3500	2.8400	38.5100	0.2100	8.0871	9.0000	346.5900 (29a)
Flat Bay Roofs	3.1000		3.1000	0.1400	0.4340	9.0000	27.9000 (30)
Pitched Cold Roof Areas	56.6500		56.6500	0.1000	5.6650	9.0000	509.8500 (30)
Sloping Roofs	21.1200	3.0600	18.0600	0.1500	2.7090	9.0000	162.5400 (30)
Flat Dormer Roofs	4.2600		4.2600	0.1600	0.6816	9.0000	38.3400 (30)
Total net area of external elements Aum(A, m ²)			456.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 117.8867		(33)
Internal Wall - Masonry			90.7200			75.0000	6804.0000 (32c)
Internal Wall - Timber			196.0500			9.0000	1764.4500 (32c)
Internal Floor			76.5500			75.0000	5741.2500 (32d)
Internal Floor			51.5400			18.0000	927.7200 (32d)
Internal Ceiling			76.5500			75.0000	5741.2500 (32e)
Internal Ceiling			51.5400			18.0000	927.7200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 52580.1600 (34)
Thermal mass parameter (TMP) = Cm / TFA in kJ/m ² K							253.1056 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							34.3211 (36)
Total fabric heat loss							(33) + (36) = 152.2078 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	116.9267	116.2062	115.4999	112.1825	111.5619	108.6726	108.6726	108.1375	109.7855	111.5619	112.8175	114.1301 (38)
Heat transfer coeff	269.1345	268.4139	267.7076	264.3903	263.7696	260.8803	260.8803	260.3453	261.9933	263.7696	265.0252	266.3379 (39)
Average = Sum(39)m / 12 =												264.3873 (39)
HLP	1.2955	1.2921	1.2887	1.2727	1.2697	1.2558	1.2558	1.2532	1.2612	1.2697	1.2758	1.2821 (40)
HLP (average)												1.2727 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Assumed occupancy												3.0120 (42)
Average daily hot water use (litres/day)												105.7347 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	116.3082	112.0788	107.8494	103.6200	99.3906	95.1613	95.1613	99.3906	103.6200	107.8494	112.0788	116.3082 (44)
Energy content (annual)	172.4817	150.8536	155.6674	135.7146	130.2214	112.3712	104.1284	119.4889	120.9159	140.9159	153.8207	167.0393 (45)
Energy content (annual)	Total = Sum(45)m =											1663.6190 (45)
Distribution loss (46)m = 0.15 x (45)m	25.8723	22.6280	23.3501	20.3572	19.5332	16.8557	15.6193	17.9233	18.1374	21.1374	23.0731	25.0559 (46)
Water storage loss:												
Store volume												246.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8802 (55)
Total storage loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (56)
If cylinder contains dedicated solar storage	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (64)
Total per year (kWh/year) = Sum(64)m =												2258.7880 (64)
Heat gains from water heating, kWh/month	97.7890	86.6843	92.1983	84.2595	83.7375	76.4978	75.0616	80.1689	79.3390	87.2934	90.2798	95.9795 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.4406	30.5898	24.8773	18.8337	14.0784	11.8856	12.8428	16.6936	22.4061	28.4497	33.2050	35.3978 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	378.3432	382.2692	372.3758	351.3138	324.7269	299.7389	283.0454	279.1194	289.0128	310.0748	336.6617	361.6497 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795 (71)
Water heating gains (Table 5)	131.4369	128.9944	123.9224	117.0271	112.5504	106.2470	100.8892	107.7539	110.1930	117.3298	125.3886	129.0046 (72)
Total internal gains	615.4005	613.0333	592.3553	558.3544	522.5355	489.0513	467.9572	474.7467	492.7917	527.0341	566.4351	597.2319 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast		14.1600	11.2829	0.6300	0.7000	0.7700	48.8267 (75)					
Southeast		1.9600	36.7938	0.6300	0.7000	0.7700	22.0396 (77)					
Southwest		14.6100	36.7938	0.6300	0.7000	0.7700	164.2847 (79)					
Northwest		3.0400	11.2829	0.6300	0.7000	0.7700	10.4826 (81)					
Northeast		3.0600	16.8560	0.6300	0.7000	1.0000	20.4719 (82)					
Solar gains	266.1054	480.5624	730.5910	1028.6628	1265.5383	1306.4306	1238.6988	1054.2058	832.5239	550.7673	323.6878	224.5322 (83)
Total gains	881.5058	1093.5957	1322.9463	1587.0173	1788.0738	1795.4819	1706.6561	1528.9525	1325.3156	1077.8014	890.1229	821.7642 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.2688	54.4145	54.5580	55.2426	55.3726	55.9858	55.9858	56.1009	55.7480	55.3726	55.1102	54.8386
alpha	4.6179	4.6276	4.6372	4.6828	4.6915	4.7324	4.7324	4.7401	4.7165	4.6915	4.6740	4.6559
util living area	0.9996	0.9987	0.9955	0.9807	0.9263	0.7943	0.6350	0.7125	0.9257	0.9924	0.9990	0.9997 (86)
MIT	19.7591	19.8842	20.1014	20.4025	20.6803	20.8625	20.9216	20.9071	20.7513	20.3921	20.0245	19.7438 (87)
Th 2	19.8443	19.8471	19.8497	19.8623	19.8646	19.8756	19.8756	19.8777	19.8714	19.8646	19.8599	19.8549 (88)
util rest of house	0.9994	0.9982	0.9937	0.9721	0.8914	0.7015	0.4911	0.5710	0.8747	0.9879	0.9986	0.9996 (89)
MIT 2	18.1758	18.3610	18.6802	19.1253	19.5106	19.7354	19.7837	19.7782	19.6171	19.1162	18.5762	18.1614 (90)
Living area fraction	fLA = Living area / (4) =											0.0955 (91)
MIT	18.3270	18.5064	18.8159	19.2473	19.6223	19.8430	19.8924	19.8860	19.7254	19.2380	18.7145	18.3125 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1770	18.3564	18.6659	19.0973	19.4723	19.6930	19.7424	19.7360	19.5754	19.0880	18.5645	18.1625 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9990	0.9972	0.9908	0.9638	0.8756	0.6837	0.4725	0.5506	0.8561	0.9829	0.9977	0.9993 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Useful gains	880.6492	1090.5648	1310.8255	1529.6091	1565.5986	1227.5825	806.3349	841.7755	1134.5478	1059.4073	888.0945	821.1970 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
Month fracti	3734.7764	3611.8977	3256.9058	2696.0588	2050.0912	1328.6636	819.7924	868.5196	1434.5194	2238.8824	3038.3798	3718.7527 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	2123.4707	1694.3357	1447.8837	839.8438	360.4625	0.0000	0.0000	0.0000	0.0000	877.5295	1548.2054	2155.7814 (98)
Space heating per m2												11047.5127 (98)
												(98) / (4) = 53.1795 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												11879.0459 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2123.4707	1694.3357	1447.8837	839.8438	360.4625	0.0000	0.0000	0.0000	0.0000	877.5295	1548.2054	2155.7814 (98)
Space heating efficiency (main heating system 1)	93.0000	93.0000	93.0000	93.0000	93.0000	0.0000	0.0000	0.0000	0.0000	93.0000	93.0000	93.0000 (210)
Space heating fuel (main heating system)	2283.3018	1821.8664	1556.8642	903.0578	387.5941	0.0000	0.0000	0.0000	0.0000	943.5801	1664.7370	2318.0446 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (64)
Efficiency of water heater (217)m	89.4613	89.3564	89.1122	88.4649	86.7211	79.9000	79.9000	79.9000	79.9000	88.4778	89.2166	79.9000 (216)
Fuel for water heating, kWh/month	249.3037	219.9176	231.4115	208.7071	208.4498	201.8638	193.5882	212.8128	212.5581	216.3983	227.2432	243.1118 (219)
Water heating fuel used												2625.3661 (219)
Annual totals kWh/year												
Space heating fuel - main system												11879.0459 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												608.2314 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 3.04 * 677 * 1.00) =										-1645.2598		-1645.2598 (233)
Total delivered energy for all uses												13542.3837 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	11879.0459	0.2160	2565.8739 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2625.3661	0.2160	567.0791 (264)
Space and water heating			3132.9530 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	608.2314	0.5190	315.6721 (268)
Energy saving/generation technologies			
PV Unit	-1645.2598	0.5190	-853.8898 (269)
Total CO2, kg/year			2633.6603 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.6800 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			12.6800 ZC1
Total Floor Area		TFA	207.7400
Assumed number of occupants		N	3.0120
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			10.7923 ZC2
CO2 emissions from cooking, equation (L16)			0.9208 ZC3
Total CO2 emissions			24.3931 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			24.3931 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6500 (1b)	x 2.8300 (2b)	= 225.4095 (1b) - (3b)
First floor	76.5500 (1c)	x 3.1200 (2c)	= 238.8360 (1c) - (3c)
Second floor	51.5400 (1d)	x 2.5600 (2d)	= 131.9424 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	207.7400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 596.1879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0671 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3171 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3171 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4043	0.3964	0.3884	0.3488	0.3409	0.3012	0.3012	0.2933	0.3171	0.3409	0.3567	0.3726 (22b)
Effective ac	0.5817	0.5786	0.5754	0.5608	0.5581	0.5454	0.5454	0.5430	0.5503	0.5581	0.5636	0.5694 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.7200	1.0000	2.7200		(26)
TER Semi-glazed door			2.4500	1.2000	2.9400		(26a)
TER Opening Type (Uw = 1.40)			33.7700	1.3258	44.7708		(27)
TER Room Window (Uw = 1.70)			3.0600	1.5918	4.8708		(27a)
Ground Floor			79.6500	0.1300	10.3545		(28a)
External Walls	250.7800	36.1000	214.6800	0.1800	38.6424		(29a)
Ashlar & Dormer Walls	41.3500	2.8400	38.5100	0.1800	6.9318		(29a)
Flat Bay Roofs	3.1000		3.1000	0.1300	0.4030		(30)
Pitched Cold Roof Areas	56.6500		56.6500	0.1300	7.3645		(30)
Sloping Roofs	21.1200	3.0600	18.0600	0.1300	2.3478		(30)
Flat Dormer Roofs	4.2600		4.2600	0.1300	0.5538		(30)
Total net area of external elements Aum(A, m ²)			456.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	121.8994	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.4270 (36)
Total fabric heat loss							(33) + (36) = 143.3264 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	114.4501	113.8257	113.2137	110.3391	109.8013	107.2976	107.2976	106.8340	108.2620	109.8013	110.8893	112.0268 (38)
Average = Sum(39)m / 12 =	257.7765	257.1521	256.5401	253.6655	253.1277	250.6241	250.6241	250.1604	251.5884	253.1277	254.2157	255.3532 (39)
												253.6630 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2409	1.2379	1.2349	1.2211	1.2185	1.2064	1.2064	1.2042	1.2111	1.2185	1.2237	1.2292 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												3.0120 (42)
Average daily hot water use (litres/day)												105.7347 (43)
Daily hot water use	116.3082	112.0788	107.8494	103.6200	99.3906	95.1613	95.1613	99.3906	103.6200	107.8494	112.0788	116.3082 (44)
Energy conte	172.4817	150.8536	155.6674	135.7146	130.2214	112.3712	104.1284	119.4889	120.9159	140.9159	153.8207	167.0393 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1663.6190 (45)
Distribution loss (46)m = 0.15 x (45)m														
	25.8723	22.6280	23.3501	20.3572	19.5332	16.8557	15.6193	17.9233	18.1374	21.1374	23.0731	25.0559	(46)	
Water storage loss:														
Store volume														246.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):														1.8719 (48)
Temperature factor from Table 2b														0.5400 (49)
Enter (49) or (54) in (55)														1.0109 (55)
Total storage loss	31.3364	28.3038	31.3364	30.3255	31.3364	30.3255	31.3364	31.3364	30.3255	31.3364	30.3255	31.3364	(56)	
If cylinder contains dedicated solar storage	31.3364	28.3038	31.3364	30.3255	31.3364	30.3255	31.3364	31.3364	30.3255	31.3364	30.3255	31.3364	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month	227.0805	200.1686	210.2662	188.5521	184.8202	165.2087	158.7272	174.0876	173.7535	195.5147	206.6582	221.6381	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	227.0805	200.1686	210.2662	188.5521	184.8202	165.2087	158.7272	174.0876	173.7535	195.5147	206.6582	221.6381	(64)	
Total per year (kWh/year) = Sum(64)m =													2306.4756 (64)	
Heat gains from water heating, kWh/month	101.0292	89.6108	95.4384	87.3951	86.9776	79.6334	78.3017	83.4091	82.4746	90.5336	93.4154	99.2196	(65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.4406	30.5898	24.8773	18.8337	14.0784	11.8856	12.8428	16.6936	22.4061	28.4497	33.2050	35.3978	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	378.3432	382.2692	372.3758	351.3138	324.7269	299.7389	283.0454	279.1194	289.0128	310.0748	336.6617	361.6497	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	(71)
Water heating gains (Table 5)	135.7919	133.3495	128.2775	121.3821	116.9054	110.6020	105.2442	112.1090	114.5480	121.6849	129.7436	133.3597	(72)
Total internal gains	619.7555	617.3883	596.7104	562.7095	526.8905	493.4063	472.3123	479.1017	497.1467	531.3891	570.7901	601.5870	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains					
			m ²	Table 6a	Specific data	Specific data	factor	W					
				W/m ²	or Table 6b	or Table 6c	Table 6d						
Northeast			14.1600	11.2829	0.6300	0.7000	0.7700	48.8267 (75)					
Southeast			1.9600	36.7938	0.6300	0.7000	0.7700	22.0396 (77)					
Southwest			14.6100	36.7938	0.6300	0.7000	0.7700	164.2847 (79)					
Northwest			3.0400	11.2829	0.6300	0.7000	0.7700	10.4826 (81)					
Northeast			3.0600	16.8560	0.6300	0.7000	1.0000	20.4719 (82)					
Solar gains	266.1054	480.5624	730.5910	1028.6628	1265.5383	1306.4306	1238.6988	1054.2058	832.5239	550.7673	323.6878	224.5322	(83)
Total gains	885.8609	1097.9507	1327.3014	1591.3723	1792.4288	1799.8369	1711.0111	1533.3076	1329.6706	1082.1564	894.4779	826.1192	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	55.9647	56.1006	56.2344	56.8717	56.9925	57.5619	57.5619	57.6686	57.3412	56.9925	56.7486	56.4958	
alpha	4.7310	4.7400	4.7490	4.7914	4.7995	4.8375	4.8375	4.8446	4.8227	4.7995	4.7832	4.7664	
util living area	0.9996	0.9986	0.9952	0.9788	0.9188	0.7777	0.6149	0.6932	0.9179	0.9917	0.9990	0.9997	(86)
MIT	19.4793	19.6457	19.9320	20.3253	20.6842	20.9086	20.9773	20.9607	20.7696	20.3037	19.8223	19.4562	(87)
Th 2	19.8875	19.8898	19.8922	19.9032	19.9052	19.9149	19.9149	19.9166	19.9112	19.9052	19.9011	19.8967	(88)
util rest of house	0.9994	0.9981	0.9933	0.9697	0.8824	0.6859	0.4779	0.5565	0.8651	0.9869	0.9985	0.9996	(89)
MIT 2	17.8469	18.0919	18.5116	19.0874	19.5813	19.8509	19.9062	19.8993	19.7070	19.0633	18.3584	17.8194	(90)
Living area fraction													fLA = Living area / (4) =
MIT	18.0028	18.2403	18.6472	19.2056	19.6867	19.9519	20.0085	20.0007	19.8085	19.1818	18.4982	17.9758	(92)
Temperature adjustment													0.0000
adjusted MIT	18.0028	18.2403	18.6472	19.2056	19.6867	19.9519	20.0085	20.0007	19.8085	19.1818	18.4982	17.9758	(93)

8. Space heating requirement

Utilisation	0.9989	0.9969	0.9900	0.9616	0.8733	0.6894	0.4904	0.5682	0.8585	0.9820	0.9975	0.9992	(94)
Useful gains	884.9053	1094.5744	1313.9694	1530.1944	1565.3815	1240.8755	839.1391	871.1858	1141.5707	1062.6536	892.2391	825.4856	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	3532.2563	3430.4863	3116.2554	2614.1859	2021.6452	1341.3232	854.2573	900.7441	1436.1824	2172.2812	2897.6023	3517.6851	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1969.6292	1569.7328	1340.9007	780.4739	339.4602	0.0000	0.0000	0.0000	0.0000	825.5629	1443.8615	2002.9965	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Space heating 10272.6178 (98)
 Space heating per m2 (98) / (4) = 49.4494 (99)

 8c. Space cooling requirement

Not applicable

 9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
 Fraction of space heat from main system(s) 1.0000 (202)
 Efficiency of main space heating system 1 (in %) 93.5000 (206)
 Efficiency of secondary/supplementary heating system, % 0.0000 (208)
 Space heating requirement 10986.7570 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1969.6292	1569.7328	1340.9007	780.4739	339.4602	0.0000	0.0000	0.0000	0.0000	825.5629	1443.8615	2002.9965	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	2106.5553	1678.8586	1434.1184	834.7314	363.0591	0.0000	0.0000	0.0000	0.0000	882.9550	1544.2369	2142.2422	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	227.0805	200.1686	210.2662	188.5521	184.8202	165.2087	158.7272	174.0876	173.7535	195.5147	206.6582	221.6381	(64)
Efficiency of water heater (217)m	89.2627	89.1481	88.8845	88.1989	86.4153	79.8000	79.8000	79.8000	79.8000	88.2346	89.0057	89.3070	(216)
Fuel for water heating, kWh/month	254.3956	224.5349	236.5612	213.7807	213.8743	207.0284	198.9062	218.1549	217.7362	221.5850	232.1853	248.1756	(219)
Water heating fuel used													2686.9183 (219)
Annual totals kWh/year													
Space heating fuel - main system													10986.7570 (211)
Space heating fuel - secondary													0.0000 (215)

Electricity for pumps and fans:
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 75.0000 (231)
 Electricity for lighting (calculated in Appendix L) 608.2314 (232)
 Total delivered energy for all uses 14356.9067 (238)

 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	10986.7570	0.2160	2373.1395 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2686.9183	0.2160	580.3744 (264)
Space and water heating			2953.5139 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	608.2314	0.5190	315.6721 (268)
Total CO2, kg/m2/year			3308.1110 (272)
Emissions per m2 for space and water heating			14.2174 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.5196 (272b)
Emissions per m2 for pumps and fans			0.1874 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.2174 * 1.00) + 1.5196 + 0.1874, rounded to 2 d.p.			15.9200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6500 (1b)	x 2.8300 (2b)	= 225.4095 (1b) - (3b)
First floor	76.5500 (1c)	x 3.1200 (2c)	= 238.8360 (1c) - (3c)
Second floor	51.5400 (1d)	x 2.5600 (2d)	= 131.9424 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	207.7400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 596.1879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0671 (8)
Pressure test					Yes
Measured/design AP50					4.8000
Infiltration rate					0.3071 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3071 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3915	0.3839	0.3762	0.3378	0.3301	0.2917	0.2917	0.2841	0.3071	0.3301	0.3455	0.3608 (22b)
Effective ac	0.5767	0.5737	0.5708	0.5571	0.5545	0.5426	0.5426	0.5403	0.5472	0.5545	0.5597	0.5651 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			33.7700	1.1450	38.6679		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			3.0600	1.3258	4.0568		(27a)
Ground Floor			79.6500	0.1200	9.5580	75.0000	5973.7500 (28a)
External Walls	250.7800	36.1000	214.6800	0.1900	40.7892	110.0000	23614.8000 (29a)
Ashlar & Dormer Walls	41.3500	2.8400	38.5100	0.2100	8.0871	9.0000	346.5900 (29a)
Flat Bay Roofs	3.1000		3.1000	0.1400	0.4340	9.0000	27.9000 (30)
Pitched Cold Roof Areas	56.6500		56.6500	0.1000	5.6650	9.0000	509.8500 (30)
Sloping Roofs	21.1200	3.0600	18.0600	0.1500	2.7090	9.0000	162.5400 (30)
Flat Dormer Roofs	4.2600		4.2600	0.1600	0.6816	9.0000	38.3400 (30)
Total net area of external elements Aum(A, m ²)			456.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 117.8867		(33)
Internal Wall - Masonry			90.7200			75.0000	6804.0000 (32c)
Internal Wall - Timber			196.0500			9.0000	1764.4500 (32c)
Internal Floor			76.5500			75.0000	5741.2500 (32d)
Internal Floor			51.5400			18.0000	927.7200 (32d)
Internal Ceiling			76.5500			75.0000	5741.2500 (32e)
Internal Ceiling			51.5400			9.0000	463.8600 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 52116.3000 (34)
Thermal mass parameter (TMP) = Cm / TFA in kJ/m ² K							250.8727 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							34.3211 (36)
Total fabric heat loss							(33) + (36) = 152.2078 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	113.4519	112.8663	112.2923	109.5962	109.0917	106.7435	106.7435	106.3086	107.6480	109.0917	110.1122	111.1790 (38)
Heat transfer coeff	265.6597	265.0740	264.5000	261.8039	261.2995	258.9512	258.9512	258.5164	259.8557	261.2995	262.3199	263.3868 (39)
Average = Sum(39)m / 12 =												261.8015 (39)
HLP	1.2788	1.2760	1.2732	1.2602	1.2578	1.2465	1.2465	1.2444	1.2509	1.2578	1.2627	1.2679 (40)
HLP (average)												1.2602 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Assumed occupancy												3.0120 (42)
Average daily hot water use (litres/day)												105.7347 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	116.3082	112.0788	107.8494	103.6200	99.3906	95.1613	95.1613	99.3906	103.6200	107.8494	112.0788	116.3082 (44)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	36.6524	32.0564	33.0793	28.8394	27.6720	23.8789	22.1273	25.3914	25.6946	29.9446	32.6869	35.4959 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.4406	30.5898	24.8773	18.8337	14.0784	11.8856	12.8428	16.6936	22.4061	28.4497	33.2050	35.3978 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	378.3432	382.2692	372.3758	351.3138	324.7269	299.7389	283.0454	279.1194	289.0128	310.0748	336.6617	361.6497 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795 (71)
Water heating gains (Table 5)	49.2639	47.7030	44.4615	40.0547	37.1936	33.1651	29.7410	34.1282	35.6870	40.2481	45.3985	47.7095 (72)
Total internal gains	530.2275	528.7418	509.8943	478.3820	444.1787	412.9694	393.8090	398.1210	415.2857	446.9524	483.4450	512.9368 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	14.1600	11.2829	0.6300	0.7000	0.7700	48.8267 (75)						
Southeast	1.9600	36.7938	0.6300	0.7000	0.7700	22.0396 (77)						
Southwest	14.6100	36.7938	0.6300	0.7000	0.7700	164.2847 (79)						
Northwest	3.0400	11.2829	0.6300	0.7000	0.7700	10.4826 (81)						
Northeast	3.0600	16.8560	0.6300	0.7000	1.0000	20.4719 (82)						
Solar gains	266.1054	480.5624	730.5910	1028.6628	1265.5383	1306.4306	1238.6988	1054.2058	832.5239	550.7673	323.6878	224.5322 (83)
Total gains	796.3329	1009.3042	1240.4854	1507.0449	1709.7170	1719.4001	1632.5078	1452.3268	1247.8096	997.7197	807.1328	737.4690 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.4936	54.6140	54.7325	55.2962	55.4029	55.9053	55.9053	55.9994	55.7107	55.4029	55.1874	54.9638	
alpha	4.6329	4.6409	4.6488	4.6864	4.6935	4.7270	4.7270	4.7333	4.7140	4.6935	4.6792	4.6643	
util living area	0.9997	0.9991	0.9964	0.9836	0.9342	0.8099	0.6538	0.7344	0.9370	0.9942	0.9993	0.9998 (86)	
MIT	19.3963	19.5634	19.8538	20.2551	20.6317	20.8827	20.9681	20.9456	20.7238	20.2370	19.7455	19.3723 (87)	
Th 2	19.8575	19.8597	19.8619	19.8721	19.8740	19.8830	19.8830	19.8846	19.8795	19.8740	19.8701	19.8661 (88)	
util rest of house	0.9996	0.9987	0.9950	0.9763	0.9023	0.7200	0.5091	0.5940	0.8919	0.9908	0.9990	0.9997 (89)	
MIT 2	18.3874	18.5562	18.8477	19.2528	19.6117	19.8254	19.8745	19.8677	19.7073	19.2396	18.7464	18.3702 (90)	
Living area fraction												fLA = Living area / (4) = 0.0955 (91)	
MIT	18.4838	18.6524	18.9438	19.3485	19.7091	19.9264	19.9789	19.9707	19.8044	19.3349	18.8418	18.4659 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.4838	18.6524	18.9438	19.3485	19.7091	19.9264	19.9789	19.9707	19.8044	19.3349	18.8418	18.4659 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9994	0.9981	0.9933	0.9716	0.8963	0.7241	0.5226	0.6063	0.8878	0.9883	0.9986	0.9996 (94)
Ext temp.	795.8644	1007.4197	1232.1715	1464.1894	1532.4926	1245.0269	853.0751	880.5387	1107.8301	986.0637	806.0012	737.1708 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	3768.0564	3645.4002	3291.3735	2735.4536	2092.7785	1379.2657	874.9820	923.0760	1482.3222	2282.4142	3080.1197	3757.4594 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m ²	2211.3108	1772.7229	1532.0463	915.3102	416.8527	0.0000	0.0000	0.0000	0.0000	964.4848	1637.3653	2247.0948 (98)
												(98) / (4) = 56.3069 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

 8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	2434.1416	1916.2392	1964.7245	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7641	0.8460	0.7918	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1859.8387	1621.0471	1555.5777	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	2120.4444	2017.5639	1816.6917	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	187.6361	295.0085	194.2688	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												676.9135 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	46.9090	73.7521	48.5672	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												169.2284 (107)
Energy for space heating												0.8146 (108)
Energy for space cooling												56.3069 (99)
Total												0.8146 (108)
Dwelling Fabric Energy Efficiency (DFEE)												57.1215 (109)
												57.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6500 (1b)	x 2.8300 (2b)	= 225.4095 (1b) - (3b)
First floor	76.5500 (1c)	x 3.1200 (2c)	= 238.8360 (1c) - (3c)
Second floor	51.5400 (1d)	x 2.5600 (2d)	= 131.9424 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	207.7400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 596.1879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.0671 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3171 (18)	
Number of sides sheltered				0 (19)	
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3171 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4043	0.3964	0.3884	0.3488	0.3409	0.3012	0.3012	0.2933	0.3171	0.3409	0.3567	0.3726 (22b)
Effective ac	0.5817	0.5786	0.5754	0.5608	0.5581	0.5454	0.5454	0.5430	0.5503	0.5581	0.5636	0.5694 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.7200	1.0000	2.7200		(26)
TER Semi-glazed door			2.4500	1.2000	2.9400		(26a)
TER Opening Type (Uw = 1.40)			33.7700	1.3258	44.7708		(27)
TER Room Window (Uw = 1.70)			3.0600	1.5918	4.8708		(27a)
Ground Floor			79.6500	0.1300	10.3545		(28a)
External Walls	250.7800	36.1000	214.6800	0.1800	38.6424		(29a)
Ashlar & Dormer Walls	41.3500	2.8400	38.5100	0.1800	6.9318		(29a)
Flat Bay Roofs	3.1000		3.1000	0.1300	0.4030		(30)
Pitched Cold Roof Areas	56.6500		56.6500	0.1300	7.3645		(30)
Sloping Roofs	21.1200	3.0600	18.0600	0.1300	2.3478		(30)
Flat Dormer Roofs	4.2600		4.2600	0.1300	0.5538		(30)
Total net area of external elements Aum(A, m ²)			456.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	121.8994	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.4270 (36)
Total fabric heat loss							(33) + (36) = 143.3264 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	114.4501	113.8257	113.2137	110.3391	109.8013	107.2976	107.2976	106.8340	108.2620	109.8013	110.8893	112.0268 (38)
Average = Sum(39)m / 12 =	257.7765	257.1521	256.5401	253.6655	253.1277	250.6241	250.6241	250.1604	251.5884	253.1277	254.2157	255.3532 (39)
												253.6630 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2409	1.2379	1.2349	1.2211	1.2185	1.2064	1.2064	1.2042	1.2111	1.2185	1.2237	1.2292 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												3.0120 (42)
Average daily hot water use (litres/day)												105.7347 (43)
Daily hot water use	116.3082	112.0788	107.8494	103.6200	99.3906	95.1613	95.1613	99.3906	103.6200	107.8494	112.0788	116.3082 (44)
Energy conte	172.4817	150.8536	155.6674	135.7146	130.2214	112.3712	104.1284	119.4889	120.9159	140.9159	153.8207	167.0393 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1663.6190 (45)	
Distribution loss (46)m = 0.15 x (45)m															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water storage loss:															
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage															
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	36.6524	32.0564	33.0793	28.8394	27.6720	23.8789	22.1273	25.3914	25.6946	29.9446	32.6869	35.4959	65		

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	150.5994	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	34.4406	30.5898	24.8773	18.8337	14.0784	11.8856	12.8428	16.6936	22.4061	28.4497	33.2050	35.3978	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	378.3432	382.2692	372.3758	351.3138	324.7269	299.7389	283.0454	279.1194	289.0128	310.0748	336.6617	361.6497	(68)
Pumps, fans	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	38.0599	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	(71)
Total internal gains	49.2639	47.7030	44.4615	40.0547	37.1936	33.1651	29.7410	34.1282	35.6870	40.2481	45.3985	47.7095	(72)
	530.2275	528.7418	509.8943	478.3820	444.1787	412.9694	393.8090	398.1210	415.2857	446.9524	483.4450	512.9368	(73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains		
	m2		Table 6a		Specific data		Specific data		factor		W		
			W/m2		or Table 6b		or Table 6c		Table 6d				
Northeast	14.1600		11.2829		0.6300		0.7000		0.7700		48.8267 (75)		
Southeast	1.9600		36.7938		0.6300		0.7000		0.7700		22.0396 (77)		
Southwest	14.6100		36.7938		0.6300		0.7000		0.7700		164.2847 (79)		
Northwest	3.0400		11.2829		0.6300		0.7000		0.7700		10.4826 (81)		
Northeast	3.0600		16.8560		0.6300		0.7000		1.0000		20.4719 (82)		
Solar gains	266.1054	480.5624	730.5910	1028.6628	1265.5383	1306.4306	1238.6988	1054.2058	832.5239	550.7673	323.6878	224.5322	(83)
Total gains	796.3329	1009.3042	1240.4854	1507.0449	1709.7170	1719.4001	1632.5078	1452.3268	1247.8096	997.7197	807.1328	737.4690	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.9647	56.1006	56.2344	56.8717	56.9925	57.5619	57.5619	57.6686	57.3412	56.9925	56.7486	56.4958	
alpha	4.7310	4.7400	4.7490	4.7914	4.7995	4.8375	4.8375	4.8446	4.8227	4.7995	4.7832	4.7664	
util living area	0.9997	0.9991	0.9964	0.9829	0.9301	0.7987	0.6389	0.7207	0.9330	0.9941	0.9993	0.9998	(86)
MIT	19.4396	19.6065	19.8942	20.2912	20.6589	20.8968	20.9733	20.9534	20.7444	20.2674	19.7835	19.4168	(87)
Th 2	19.8875	19.8898	19.8922	19.9032	19.9052	19.9149	19.9149	19.9166	19.9112	19.9052	19.9011	19.8967	(88)
util rest of house	0.9996	0.9987	0.9949	0.9753	0.8973	0.7092	0.4992	0.5835	0.8867	0.9906	0.9990	0.9997	(89)
MIT 2	18.4545	18.6232	18.9121	19.3135	19.6628	19.8644	19.9078	19.9022	19.7522	19.2948	18.8091	18.4390	(90)
Living area fraction													fLA = Living area / (4) =
MIT	18.5486	18.7171	19.0059	19.4068	19.7580	19.9630	20.0095	20.0026	19.8469	19.3877	18.9021	18.5324	(92)
Temperature adjustment													0.0000
adjusted MIT	18.5486	18.7171	19.0059	19.4068	19.7580	19.9630	20.0095	20.0026	19.8469	19.3877	18.9021	18.5324	(93)

8. Space heating requirement

Utilisation	0.9994	0.9982	0.9932	0.9706	0.8917	0.7137	0.5123	0.5957	0.8831	0.9881	0.9986	0.9996	(94)
Useful gains	795.8820	1007.4491	1232.1033	1462.7800	1524.6252	1227.1884	836.3176	865.1137	1101.9611	985.8761	806.0272	737.1845	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	3672.9547	3553.0914	3208.2617	2665.2248	2039.6930	1344.1029	854.5097	901.2224	1445.8630	2224.4122	3000.2918	3659.8205	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	2140.5421	1710.6717	1470.2619	865.7602	383.2105	0.0000	0.0000	0.0000	0.0000	921.4708	1579.8705	2174.4412	(98)
Space heating													11246.2288 (98)
Space heating per m2													(98) / (4) =
													54.1361 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	2355.8661	1854.6180	1901.2191	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7824	0.8616	0.8095	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1843.1144	1597.9716	1539.0748	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2120.4444	2017.5639	1816.6917	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	199.6776	312.1767	206.5470	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling Cooled fraction												718.4013 (104)
Intermittency factor (Table 10b)												FC = cooled area / (4) =
0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.9194	78.0442	51.6368	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling Space cooling per m2												179.6003 (107)
Energy for space heating												0.8645 (108)
Energy for space cooling												54.1361 (99)
Total												0.8645 (108)
Target Fabric Energy Efficiency (TFEE)												55.0006 (109)
												63.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6500 (1b)	x 2.8300 (2b)	= 225.4095 (1b) - (3b)
First floor	76.5500 (1c)	x 3.1200 (2c)	= 238.8360 (1c) - (3c)
Second floor	51.5400 (1d)	x 2.5600 (2d)	= 131.9424 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	207.7400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 596.1879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					6 * 10 = 60.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					60.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					4.8000
Infiltration rate					0.3406 (18)
Number of sides sheltered					0 (19)
					Shelter factor
Infiltration rate adjusted to include shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20) (21) = (18) x (20) = 0.3406 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.9000	3.7000	3.6000	3.3000	3.3000	3.2000	3.2000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9750	0.9250	0.9000	0.8250	0.8250	0.8000	0.8000	0.8500	0.8250	0.9250 (22a)
Adj infilt rate												
Effective ac	0.3492	0.3236	0.3321	0.3151	0.3066	0.2810	0.2810	0.2725	0.2725	0.2895	0.2810	0.3151 (22b)
	0.5610	0.5524	0.5552	0.5496	0.5470	0.5395	0.5395	0.5371	0.5371	0.5419	0.5395	0.5496 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			33.7700	1.1450	38.6679		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			3.0600	1.3258	4.0568		(27a)
Ground Floor			79.6500	0.1200	9.5580	75.0000	5973.7500 (28a)
External Walls	250.7800	36.1000	214.6800	0.1900	40.7892	110.0000	23614.8000 (29a)
Ashlar & Dormer Walls	41.3500	2.8400	38.5100	0.2100	8.0871	9.0000	346.5900 (29a)
Flat Bay Roofs	3.1000		3.1000	0.1400	0.4340	9.0000	27.9000 (30)
Pitched Cold Roof Areas	56.6500		56.6500	0.1000	5.6650	9.0000	509.8500 (30)
Sloping Roofs	21.1200	3.0600	18.0600	0.1500	2.7090	9.0000	162.5400 (30)
Flat Dormer Roofs	4.2600		4.2600	0.1600	0.6816	9.0000	38.3400 (30)
Total net area of external elements Aum(A, m ²)			456.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 117.8867		(33)
Internal Wall - Masonry			90.7200			75.0000	6804.0000 (32c)
Internal Wall - Timber			196.0500			9.0000	1764.4500 (32c)
Internal Floor			76.5500			75.0000	5741.2500 (32d)
Internal Floor			51.5400			18.0000	927.7200 (32d)
Internal Ceiling			76.5500			75.0000	5741.2500 (32e)
Internal Ceiling			51.5400			18.0000	927.7200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 52580.1600 (34)
Thermal mass parameter (TMP) = Cm / TFA in kJ/m ² K							253.1056 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							34.3211 (36)
Total fabric heat loss							(33) + (36) = 152.2078 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	110.3634	108.6726	109.2219	108.1375	107.6167	106.1400	106.1400	105.6763	105.6763	106.6180	106.1400	108.1375 (38)
Heat transfer coeff	262.5711	260.8803	261.4297	260.3453	259.8245	258.3478	258.3478	257.8840	257.8840	258.8257	258.3478	260.3453 (39)
Average = Sum(39)m / 12 =												259.5861 (39)
HLP	1.2639	1.2558	1.2584	1.2532	1.2507	1.2436	1.2436	1.2414	1.2414	1.2459	1.2436	1.2532 (40)
HLP (average)												1.2496 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Assumed occupancy												3.0120 (42)
Average daily hot water use (litres/day)												105.7347 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	116.3082	112.0788	107.8494	103.6200	99.3906	95.1613	95.1613	99.3906	103.6200	107.8494	112.0788	116.3082 (44)
Energy content (annual)	172.4817	150.8536	155.6674	135.7146	130.2214	112.3712	104.1284	119.4889	120.9159	140.9159	153.8207	167.0393 (45)
Distribution loss (46)m = 0.15 x (45)m	25.8723	22.6280	23.3501	20.3572	19.5332	16.8557	15.6193	17.9233	18.1374	21.1374	23.0731	25.0559 (46)
Water storage loss:												
Store volume												246.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8802 (55)
Total storage loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (56)
If cylinder contains dedicated solar storage	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (64)
Total per year (kWh/year) = Sum(64)m =												2259.7880 (64)
RHI water heating demand												2259 (64)
Heat gains from water heating, kWh/month	97.7890	86.6843	92.1983	84.2595	83.7375	76.4978	75.0616	80.1689	79.3390	87.2934	90.2798	95.9795 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.1014	76.4745	62.1933	47.0843	35.1961	29.7140	32.1070	41.7339	56.0152	71.1242	83.0124	88.4945 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	564.6913	570.5510	555.7847	524.3489	484.6669	447.3715	422.4558	416.5960	431.3624	462.7981	502.4801	539.7756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795 (71)
Water heating gains (Table 5)	131.4369	128.9944	123.9224	117.0271	112.5504	106.2470	100.8892	107.7539	110.1930	117.3298	125.3886	129.0046 (72)
Total internal gains	901.5533	895.3437	861.2241	807.7840	751.7371	702.6561	674.7757	685.4076	716.8943	770.5758	830.2048	876.5984 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
Northeast	14.1600	14.6223	0.6300	0.7000	0.7700	63.2778 (75)						
Southeast	1.9600	45.2918	0.6300	0.7000	0.7700	27.1298 (77)						
Southwest	14.6100	45.2918	0.6300	0.7000	0.7700	202.2280 (79)						
Northwest	3.0400	14.6223	0.6300	0.7000	0.7700	13.5851 (81)						
Northeast	3.0600	21.9592	0.6300	0.7000	1.0000	26.6698 (82)						
Solar gains	332.8905	513.8216	785.3182	1116.0942	1304.2385	1465.4371	1364.2352	1190.0836	942.4538	628.8504	394.6723	265.6069 (83)
Total gains	1234.4439	1409.1653	1646.5423	1923.8783	2055.9756	2168.0932	2039.0110	1875.4912	1659.3480	1399.4262	1224.8771	1142.2054 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.6253	55.9858	55.8682	56.1009	56.2133	56.5347	56.5347	56.6363	56.6363	56.4302	56.5347	56.1009
alpha	4.7084	4.7324	4.7245	4.7401	4.7476	4.7690	4.7690	4.7758	4.7758	4.7620	4.7690	4.7401
util living area	0.9978	0.9954	0.9861	0.9494	0.8451	0.6224	0.4383	0.4986	0.8041	0.9694	0.9948	0.9984 (86)
MIT	19.9655	20.0812	20.2978	20.5751	20.8047	20.9195	20.9397	20.9369	20.8643	20.5792	20.2365	19.9456 (87)
Th 2	19.8692	19.8756	19.8735	19.8777	19.8796	19.8853	19.8853	19.8870	19.8870	19.8834	19.8853	19.8777 (88)
util rest of house	0.9970	0.9937	0.9806	0.9286	0.7836	0.5110	0.3015	0.3541	0.7080	0.9522	0.9925	0.9978 (89)
MIT 2	18.4965	18.6702	18.9827	19.3771	19.6731	19.7898	19.8013	19.8024	19.7501	19.3953	18.9049	18.4741 (90)
Living area fraction												fLA = Living area / (4) =
MIT	18.6368	18.8050	19.1083	19.4915	19.7812	19.8977	19.9100	19.9107	19.8565	19.5083	19.0321	18.6146 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4868	18.6550	18.9583	19.3415	19.6312	19.7477	19.7600	19.7607	19.7065	19.3583	18.8821	18.4646 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Utilisation	0.9954	0.9909	0.9742	0.9154	0.7672	0.4962	0.2858	0.3371	0.6894	0.9405	0.9892	0.9967 (94)
Useful gains	1228.8017	1396.3982	1604.0154	1761.1840	1577.3669	1075.8989	582.7952	632.2022	1143.9131	1316.1948	1211.6196	1138.4140 (95)
Ext temp.	5.0000	5.6000	7.3000	9.7000	12.7000	15.5000	17.5000	17.3000	14.9000	11.5000	8.0000	5.0000 (96)
Heat loss rate W												
	3541.2507	3405.7906	3047.8334	2510.1170	1800.8845	1097.3932	583.8669	634.5809	1239.5158	2033.9400	2811.3652	3505.4573 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	1720.4620	1350.3117	1074.2006	539.2317	166.2971	0.0000	0.0000	0.0000	0.0000	534.0024	1151.8168	1761.0802 (98)
Space heating												8297.4026 (98)
RHI space heating demand												8297 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF ENERGY RATINGS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6500 (1b)	x 2.8300 (2b)	= 225.4095 (1b) - (3b)
First floor	76.5500 (1c)	x 3.1200 (2c)	= 238.8360 (1c) - (3c)
Second floor	51.5400 (1d)	x 2.5600 (2d)	= 131.9424 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	207.7400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 596.1879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					6 * 10 = 60.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					60.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					4.8000
Infiltration rate					0.3406 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3406 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4343	0.4258	0.4173	0.3747	0.3662	0.3236	0.3236	0.3151	0.3406	0.3662	0.3832	0.4003 (22b)
	0.5943	0.5907	0.5871	0.5702	0.5670	0.5524	0.5524	0.5496	0.5580	0.5670	0.5734	0.5801 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			33.7700	1.1450	38.6679		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			3.0600	1.3258	4.0568		(27a)
Ground Floor			79.6500	0.1200	9.5580	75.0000	5973.7500 (28a)
External Walls	250.7800	36.1000	214.6800	0.1900	40.7892	110.0000	23614.8000 (29a)
Ashlar & Dormer Walls	41.3500	2.8400	38.5100	0.2100	8.0871	9.0000	346.5900 (29a)
Flat Bay Roofs	3.1000		3.1000	0.1400	0.4340	9.0000	27.9000 (30)
Pitched Cold Roof Areas	56.6500		56.6500	0.1000	5.6650	9.0000	509.8500 (30)
Sloping Roofs	21.1200	3.0600	18.0600	0.1500	2.7090	9.0000	162.5400 (30)
Flat Dormer Roofs	4.2600		4.2600	0.1600	0.6816	9.0000	38.3400 (30)
Total net area of external elements Aum(A, m ²)			456.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	117.8867		(33)
Internal Wall - Masonry			90.7200			75.0000	6804.0000 (32c)
Internal Wall - Timber			196.0500			9.0000	1764.4500 (32c)
Internal Floor			76.5500			75.0000	5741.2500 (32d)
Internal Floor			51.5400			18.0000	927.7200 (32d)
Internal Ceiling			76.5500			75.0000	5741.2500 (32e)
Internal Ceiling			51.5400			18.0000	927.7200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 52580.1600 (34)
Thermal mass parameter (TMP) = Cm / TFA in kJ/m ² K							253.1056 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							34.3211 (36)
Total fabric heat loss							(33) + (36) = 152.2078 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	116.9267	116.2062	115.4999	112.1825	111.5619	108.6726	108.6726	108.1375	109.7855	111.5619	112.8175	114.1301 (38)
Heat transfer coeff	269.1345	268.4139	267.7076	264.3903	263.7696	260.8803	260.8803	260.3453	261.9933	263.7696	265.0252	266.3379 (39)
Average = Sum(39)m / 12 =												264.3873 (39)
HLP	1.2955	1.2921	1.2887	1.2727	1.2697	1.2558	1.2558	1.2532	1.2612	1.2697	1.2758	1.2821 (40)
HLP (average)												1.2727 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Assumed occupancy												3.0120 (42)
Average daily hot water use (litres/day)												105.7347 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	116.3082	112.0788	107.8494	103.6200	99.3906	95.1613	95.1613	99.3906	103.6200	107.8494	112.0788	116.3082 (44)
Energy content (annual)	172.4817	150.8536	155.6674	135.7146	130.2214	112.3712	104.1284	119.4889	120.9159	140.9159	153.8207	167.0393 (45)
Energy content (annual)	Total = Sum(45)m =											1663.6190 (45)
Distribution loss (46)m = 0.15 x (45)m	25.8723	22.6280	23.3501	20.3572	19.5332	16.8557	15.6193	17.9233	18.1374	21.1374	23.0731	25.0559 (46)
Water storage loss:												
Store volume												246.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8802 (55)
Total storage loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (56)
If cylinder contains dedicated solar storage	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (64)
Total per year (kWh/year) = Sum(64)m =												2258.7880 (64)
Heat gains from water heating, kWh/month	97.7890	86.6843	92.1983	84.2595	83.7375	76.4978	75.0616	80.1689	79.3390	87.2934	90.2798	95.9795 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.1014	76.4745	62.1933	47.0843	35.1961	29.7140	32.1070	41.7339	56.0152	71.1242	83.0124	88.4945 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	564.6913	570.5510	555.7847	524.3489	484.6669	447.3715	422.4558	416.5960	431.3624	462.7981	502.4801	539.7756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795 (71)
Water heating gains (Table 5)	131.4369	128.9944	123.9224	117.0271	112.5504	106.2470	100.8892	107.7539	110.1930	117.3298	125.3886	129.0046 (72)
Total internal gains	901.5533	895.3437	861.2241	807.7840	751.7371	702.6561	674.7757	685.4076	716.8943	770.5758	830.2048	876.5984 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	14.1600	11.2829	0.6300	0.7000	0.7700	48.8267 (75)						
Southeast	1.9600	36.7938	0.6300	0.7000	0.7700	22.0396 (77)						
Southwest	14.6100	36.7938	0.6300	0.7000	0.7700	164.2847 (79)						
Northwest	3.0400	11.2829	0.6300	0.7000	0.7700	10.4826 (81)						
Northeast	3.0600	16.8560	0.6300	0.7000	1.0000	20.4719 (82)						
Solar gains	266.1054	480.5624	730.5910	1028.6628	1265.5383	1306.4306	1238.6988	1054.2058	832.5239	550.7673	323.6878	224.5322 (83)
Total gains	1167.6587	1375.9061	1591.8151	1836.4469	2017.2754	2009.0868	1913.4746	1739.6134	1549.4182	1321.3432	1153.8927	1101.1307 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.2688	54.4145	54.5580	55.2426	55.3726	55.9858	55.9858	56.1009	55.7480	55.3726	55.1102	54.8386
alpha	4.6179	4.6276	4.6372	4.6828	4.6915	4.7324	4.7324	4.7401	4.7165	4.6915	4.6740	4.6559
util living area	0.9985	0.9966	0.9905	0.9669	0.8943	0.7416	0.5773	0.6470	0.8821	0.9829	0.9970	0.9989 (86)
MIT	19.8523	19.9756	20.1865	20.4745	20.7289	20.8835	20.9285	20.9190	20.7974	20.4675	20.1102	19.8351 (87)
Th 2	19.8443	19.8471	19.8497	19.8623	19.8646	19.8756	19.8756	19.8777	19.8714	19.8646	19.8599	19.8549 (88)
util rest of house	0.9980	0.9953	0.9868	0.9533	0.8501	0.6444	0.4411	0.5089	0.8149	0.9735	0.9957	0.9985 (89)
MIT 2	18.3120	18.4942	18.8031	19.2253	19.5688	19.7523	19.7866	19.7841	19.6669	19.2229	18.7012	18.2950 (90)
Living area fraction	fLA = Living area / (4) =											0.0955 (91)
MIT	18.4591	18.6357	18.9352	19.3446	19.6796	19.8603	19.8957	19.8925	19.7748	19.3417	18.8358	18.4421 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3091	18.4857	18.7852	19.1946	19.5296	19.7103	19.7457	19.7425	19.6248	19.1917	18.6858	18.2921 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9969	0.9931	0.9819	0.9423	0.8338	0.6281	0.4244	0.4907	0.7959	0.9652	0.9935	0.9977 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Useful gains	1164.0601	1366.4481	1562.9452	1730.4860	1682.0803	1261.9938	812.0442	853.5910	1233.1247	1275.3643	1146.4368	1098.5493 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	3770.3421	3646.5840	3288.8480	2721.7886	2065.2158	1333.1761	820.6409	870.2128	1447.4726	2266.2351	3070.5261	3753.2508 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1939.0738	1532.2513	1284.0717	713.7379	285.0528	0.0000	0.0000	0.0000	0.0000	737.2079	1385.3443	1975.0979 (98)
Space heating per m2												(98) / (4) = 47.4239 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												10593.3737 (211)
Space heating requirement	1939.0738	1532.2513	1284.0717	713.7379	285.0528	0.0000	0.0000	0.0000	0.0000	737.2079	1385.3443	1975.0979 (98)
Space heating efficiency (main heating system 1)	93.0000	93.0000	93.0000	93.0000	93.0000	0.0000	0.0000	0.0000	0.0000	93.0000	93.0000	93.0000 (210)
Space heating fuel (main heating system)	2085.0256	1647.5820	1380.7222	767.4601	306.5084	0.0000	0.0000	0.0000	0.0000	792.6966	1489.6176	2123.7612 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (64)
Efficiency of water heater (217)m	89.3655	89.2415	88.9517	88.1732	86.1242	79.9000	79.9000	79.9000	79.9000	88.1658	89.0771	79.9000 (216)
Fuel for water heating, kWh/month	249.5709	220.2006	231.8293	209.3976	209.8945	201.8638	193.5882	212.8128	212.5581	217.1642	227.5991	243.3548 (219)
Water heating fuel used												2629.8339 (219)
Annual totals kWh/year												
Space heating fuel - main system												10593.3737 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												608.2314 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 3.04 * 677 * 1.00) =										-1645.2598		-1645.2598 (233)
Total delivered energy for all uses												12261.1793 (238)

10a. Fuel costs - using Table 12 prices

Space heating - main system 1	10593.3737	3.4800	368.6494 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2629.8339	3.4800	91.5182 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	608.2314	13.1900	80.2257 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1645.2598	13.1900	-217.0098 (252)
Total energy cost			453.2761 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7532 (257)
SAP value		89.4922
SAP rating (Section 12)		89 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

Space heating - main system 1	10593.3737	0.2160	2288.1687 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2629.8339	0.2160	568.0441 (264)
Space and water heating			2856.2129 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	608.2314	0.5190	315.6721 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-1645.2598	0.5190	-853.8898 (269)
Total kg/year			2356.9201 (272)
CO2 emissions per m2			11.3500 (273)
EI value			87.5039
EI rating			88 (274)
EI band			B

 Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.25) / 0.9060 = 4.120$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.25) / 0.9060 = 0.2557$, stars = 4
Water heating energy efficiency	$3.48 / 0.8568 = 4.062$, stars = 4
Water heating environmental impact	$0.216 / 0.8568 = 0.2521$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	79.6500 (1b)	x 2.8300 (2b)	= 225.4095 (1b) - (3b)
First floor	76.5500 (1c)	x 3.1200 (2c)	= 238.8360 (1c) - (3c)
Second floor	51.5400 (1d)	x 2.5600 (2d)	= 131.9424 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	207.7400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 596.1879 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					6 * 10 = 60.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					60.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					4.8000
Infiltration rate					0.3406 (18)
Number of sides sheltered					0 (19)
					Shelter factor
Infiltration rate adjusted to include shelter factor					(20) = 1 - [0.075 x (19)] = 1.0000 (20) (21) = (18) x (20) = 0.3406 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.9000	3.7000	3.6000	3.3000	3.3000	3.2000	3.2000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9750	0.9250	0.9000	0.8250	0.8250	0.8000	0.8000	0.8500	0.8250	0.9250 (22a)
Adj infilt rate												
Effective ac	0.3492	0.3236	0.3321	0.3151	0.3066	0.2810	0.2810	0.2725	0.2725	0.2895	0.2810	0.3151 (22b)
	0.5610	0.5524	0.5552	0.5496	0.5470	0.5395	0.5395	0.5371	0.5371	0.5419	0.5395	0.5496 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.7200	1.4000	3.8080		(26)
Windows (Uw = 1.20)			33.7700	1.1450	38.6679		(27)
Side Door			2.4500	1.4000	3.4300		(26a)
Velux Windows (Uw = 1.40)			3.0600	1.3258	4.0568		(27a)
Ground Floor			79.6500	0.1200	9.5580	75.0000	5973.7500 (28a)
External Walls	250.7800	36.1000	214.6800	0.1900	40.7892	110.0000	23614.8000 (29a)
Ashlar & Dormer Walls	41.3500	2.8400	38.5100	0.2100	8.0871	9.0000	346.5900 (29a)
Flat Bay Roofs	3.1000		3.1000	0.1400	0.4340	9.0000	27.9000 (30)
Pitched Cold Roof Areas	56.6500		56.6500	0.1000	5.6650	9.0000	509.8500 (30)
Sloping Roofs	21.1200	3.0600	18.0600	0.1500	2.7090	9.0000	162.5400 (30)
Flat Dormer Roofs	4.2600		4.2600	0.1600	0.6816	9.0000	38.3400 (30)
Total net area of external elements Aum(A, m2)			456.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 117.8867		(33)
Internal Wall - Masonry			90.7200			75.0000	6804.0000 (32c)
Internal Wall - Timber			196.0500			9.0000	1764.4500 (32c)
Internal Floor			76.5500			75.0000	5741.2500 (32d)
Internal Floor			51.5400			18.0000	927.7200 (32d)
Internal Ceiling			76.5500			75.0000	5741.2500 (32e)
Internal Ceiling			51.5400			18.0000	927.7200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 52580.1600 (34)
Thermal mass parameter (TMP) = Cm / TFA in kJ/m2K							253.1056 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							34.3211 (36)
Total fabric heat loss							(33) + (36) = 152.2078 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	110.3634	108.6726	109.2219	108.1375	107.6167	106.1400	106.1400	105.6763	105.6763	106.6180	106.1400	108.1375 (38)
Heat transfer coeff	262.5711	260.8803	261.4297	260.3453	259.8245	258.3478	258.3478	257.8840	257.8840	258.8257	258.3478	260.3453 (39)
Average = Sum(39)m / 12 =												259.5861 (39)
HLP	1.2639	1.2558	1.2584	1.2532	1.2507	1.2436	1.2436	1.2414	1.2414	1.2459	1.2436	1.2532 (40)
HLP (average)												1.2496 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Assumed occupancy												3.0120 (42)
Average daily hot water use (litres/day)												105.7347 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	116.3082	112.0788	107.8494	103.6200	99.3906	95.1613	95.1613	99.3906	103.6200	107.8494	112.0788	116.3082 (44)
Energy content (annual)	172.4817	150.8536	155.6674	135.7146	130.2214	112.3712	104.1284	119.4889	120.9159	140.9159	153.8207	167.0393 (45)
Energy content (annual)	Total = Sum(45)m =											1663.6190 (45)
Distribution loss (46)m = 0.15 x (45)m	25.8723	22.6280	23.3501	20.3572	19.5332	16.8557	15.6193	17.9233	18.1374	21.1374	23.0731	25.0559 (46)
Water storage loss:												
Store volume												246.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8802 (55)
Total storage loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (56)
If cylinder contains dedicated solar storage	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (64)
Total per year (kWh/year) = Sum(64)m =												2258.7880 (64)
Heat gains from water heating, kWh/month	97.7890	86.6843	92.1983	84.2595	83.7375	76.4978	75.0616	80.1689	79.3390	87.2934	90.2798	95.9795 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193	180.7193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.1014	76.4745	62.1933	47.0843	35.1961	29.7140	32.1070	41.7339	56.0152	71.1242	83.0124	88.4945 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	564.6913	570.5510	555.7847	524.3489	484.6669	447.3715	422.4558	416.5960	431.3624	462.7981	502.4801	539.7756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839	56.0839 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795	-120.4795 (71)
Water heating gains (Table 5)	131.4369	128.9944	123.9224	117.0271	112.5504	106.2470	100.8892	107.7539	110.1930	117.3298	125.3886	129.0046 (72)
Total internal gains	901.5533	895.3437	861.2241	807.7840	751.7371	702.6561	674.7757	685.4076	716.8943	770.5758	830.2048	876.5984 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	14.1600	14.6223	0.6300	0.7000	0.7700	63.2778 (75)						
Southeast	1.9600	45.2918	0.6300	0.7000	0.7700	27.1298 (77)						
Southwest	14.6100	45.2918	0.6300	0.7000	0.7700	202.2280 (79)						
Northwest	3.0400	14.6223	0.6300	0.7000	0.7700	13.5851 (81)						
Northeast	3.0600	21.9592	0.6300	0.7000	1.0000	26.6698 (82)						
Solar gains	332.8905	513.8216	785.3182	1116.0942	1304.2385	1465.4371	1364.2352	1190.0836	942.4538	628.8504	394.6723	265.6069 (83)
Total gains	1234.4439	1409.1653	1646.5423	1923.8783	2055.9756	2168.0932	2039.0110	1875.4912	1659.3480	1399.4262	1224.8771	1142.2054 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.6253	55.9858	55.8682	56.1009	56.2133	56.5347	56.5347	56.6363	56.6363	56.4302	56.5347	56.1009
alpha	4.7084	4.7324	4.7245	4.7401	4.7476	4.7690	4.7690	4.7758	4.7758	4.7620	4.7690	4.7401
util living area	0.9978	0.9954	0.9861	0.9494	0.8451	0.6224	0.4383	0.4986	0.8041	0.9694	0.9948	0.9984 (86)
MIT	19.9655	20.0812	20.2978	20.5751	20.8047	20.9195	20.9397	20.9369	20.8643	20.5792	20.2365	19.9456 (87)
Th 2	19.8692	19.8756	19.8735	19.8777	19.8796	19.8853	19.8853	19.8870	19.8870	19.8834	19.8853	19.8777 (88)
util rest of house	0.9970	0.9937	0.9806	0.9286	0.7836	0.5110	0.3015	0.3541	0.7080	0.9522	0.9925	0.9978 (89)
MIT 2	18.4965	18.6702	18.9827	19.3771	19.6731	19.7898	19.8013	19.8024	19.7501	19.3953	18.9049	18.4741 (90)
Living area fraction	fLA = Living area / (4) =											0.0955 (91)
MIT	18.6368	18.8050	19.1083	19.4915	19.7812	19.8977	19.9100	19.9107	19.8565	19.5083	19.0321	18.6146 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4868	18.6550	18.9583	19.3415	19.6312	19.7477	19.7600	19.7607	19.7065	19.3583	18.8821	18.4646 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9954	0.9909	0.9742	0.9154	0.7672	0.4962	0.2858	0.3371	0.6894	0.9405	0.9892	0.9967 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Useful gains	1228.8017	1396.3982	1604.0154	1761.1840	1577.3669	1075.8989	582.7952	632.2022	1143.9131	1316.1948	1211.6196	1138.4140 (95)
Ext temp.	5.0000	5.6000	7.3000	9.7000	12.7000	15.5000	17.5000	17.3000	14.9000	11.5000	8.0000	5.0000 (96)
Heat loss rate W	3541.2507	3405.7906	3047.8334	2510.1170	1800.8845	1097.3932	583.8669	634.5809	1239.5158	2033.9400	2811.3652	3505.4573 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1720.4620	1350.3117	1074.2006	539.2317	166.2971	0.0000	0.0000	0.0000	0.0000	534.0024	1151.8168	1761.0802 (98)
Space heating												8297.4026 (98)
Space heating per m2												(98) / (4) = 39.9413 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												8921.9383 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1720.4620	1350.3117	1074.2006	539.2317	166.2971	0.0000	0.0000	0.0000	0.0000	534.0024	1151.8168	1761.0802 (98)
Space heating efficiency (main heating system 1)	93.0000	93.0000	93.0000	93.0000	93.0000	0.0000	0.0000	0.0000	0.0000	93.0000	93.0000	93.0000 (210)
Space heating fuel (main heating system)	1849.9592	1451.9480	1155.0544	579.8191	178.8140	0.0000	0.0000	0.0000	0.0000	574.1962	1238.5127	1893.6347 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	223.0303	196.5104	206.2160	184.6326	180.7700	161.2892	154.6770	170.0375	169.8339	191.4645	202.7387	217.5879 (64)
Efficiency of water heater (217)m	89.2287	89.0844	88.6872	87.6075	84.6926	79.9000	79.9000	79.9000	79.9000	87.5072	88.8197	79.9000 (216)
Fuel for water heating, kWh/month	249.9535	220.5890	232.5206	210.7497	213.4425	201.8638	193.5882	212.8128	212.5581	218.7985	228.2586	243.7000 (219)
Water heating fuel used												2638.8354 (219)
Annual totals kWh/year												
Space heating fuel - main system												8921.9383 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												608.2314 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 3.04 * 768 * 1.00) =										-1867.3874		-1867.3874 (233)
Total delivered energy for all uses												10376.6177 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	8921.9383	10.2300	912.7143 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2638.8354	10.2300	269.9529 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	608.2314	36.7200	223.3426 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-1867.3874	36.7200	-685.7046 (252)
Total energy cost			850.8451 (255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	8921.9383	0.2160	1927.1387 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2638.8354	0.2160	569.9884 (264)
Space and water heating			2497.1271 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	608.2314	0.5190	315.6721 (268)
Energy saving/generation technologies			
PV Unit	-1867.3874	0.5190	-969.1740 (269)
Total kg/year			1882.5502 (272)

13a. Primary energy - Individual heating systems including micro-CHP

Energy Primary energy factor Primary energy

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	8921.9383	1.2200	10884.7647 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2638.8354	1.2200	3219.3792 (264)
Space and water heating			14104.1439 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	608.2314	3.0700	1867.2704 (268)
Energy saving/generation technologies			
PV Unit	-1867.3874	3.0700	-5732.8792 (269)
Primary energy kWh/year			10468.7850 (272)
Primary energy kWh/m2/year			50.3937 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
 Current environmental impact rating: B 88

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	SAP increase too small
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: SAP change Cost change CO2 change
 (none)

Measures omitted - SAP change or cost saving too small:
 N Solar water heating + 0.9 -£ 119 -264 kg (14.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)	Total Savings £0		0.00 kg/m ²

Potential energy efficiency rating: B 89
 Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£251	£251	£0
Mains gas	£1286	£1286	£0
Space heating	£1043	£1043	£0
Water heating	£270	£270	£0
Lighting	£223	£223	£0
Generated (PV)	-£686	-£686	£0
Total cost of fuels	£851	£851	£0
Total cost of uses	£850	£850	£0
Delivered energy	50 kWh/m ²	50 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.9 tonnes	1.9 tonnes	0.0 tonnes
CO2 emissions per m ²	9 kg/m ²	9 kg/m ²	0 kg/m ²
Primary energy	50 kWh/m ²	50 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Built) 9.92

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	3
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	South West
Overshading	Average or unknown
Thermal mass parameter	253.1 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	1573.94 (P1)
Transmission heat loss coefficient	152.21 (37)
Summer heat loss coefficient	1726.14 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North East	0.000	1.000	None
South East	0.000	1.000	None
South West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North East	1.000	0.90	1.000	0.900 (P8)
North East	1.000	1.00	1.000	1.000 (P8)
South East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North East	14.1600	106.0502	0.6300	0.7000	0.9000	536.4119
South East	1.9600	127.3119	0.6300	0.7000	0.9000	89.1351
South West	14.6100	127.3119	0.6300	0.7000	0.9000	664.4200
North West	3.0400	106.0502	0.6300	0.7000	0.9000	115.1619
North East	3.0600	176.1235	0.6300	0.7000	1.0000	213.9045
total:						1619.0333

	Jun	Jul	Aug	
Solar gains	1749	1619	1407	(P3)
Internal gains	700	672	682	
Total summer gains	2449	2291	2090	(P5)
Summer gain/loss ratio	1.42	1.33	1.21	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 253.1)	0.23	0.23	0.23	
Threshold temperature	17.05	18.86	18.74	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			